Perceptions of the Inshore Wave Resource by Beach Water-Users in the lee of Wave Hub

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COASTAL RESEARCH WITH PLYMOUTH UNIVERSITY

sowfia
Streamlining of Ocean Wave Farms Impact Assessment

Introduction

Wave Hub Controversy

- Stakeholder opposition

Fishermen, Shipping, Tourism, **Surfers**

Reduction in wave height and quality

- Not a trivial objection!

Recreational water-users bring ~ £300 million of tourism a year to Cornwall
(Environment Agency, 2007)

Cornwall is the UK's poorest county

Gross value added (GVA) 61% of UK average
(Long, 2014)

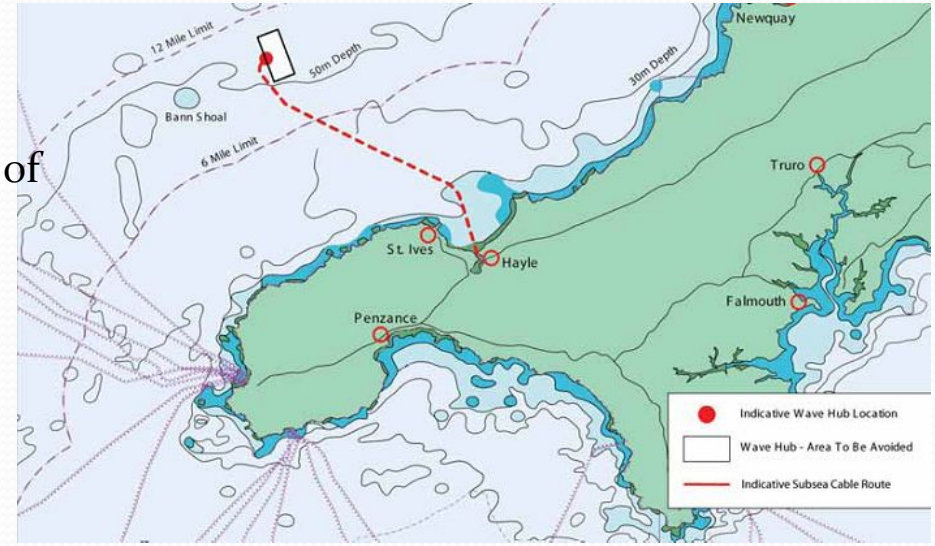


Image Courtesy of www.WaveHub.co.uk

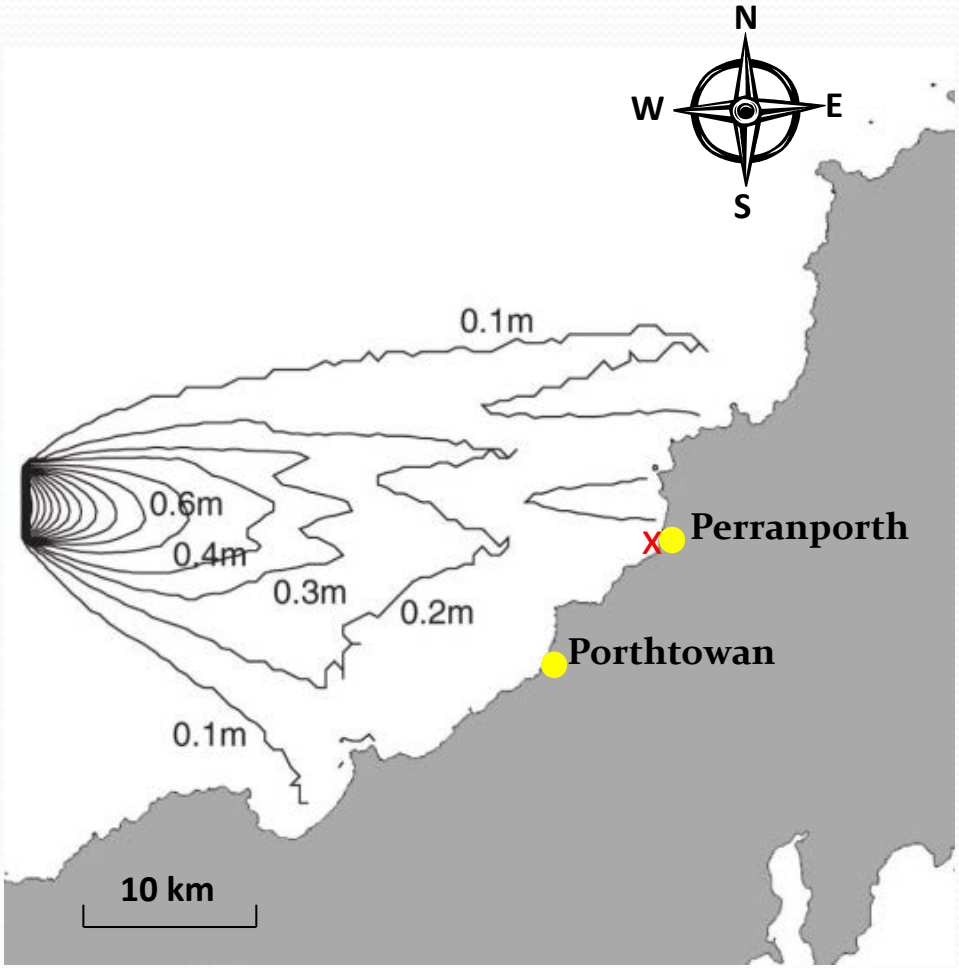
Introduction

- Modelling results indicate Wave Hub impacts will be small –

0.5 – 2% reduction in height at Perranporth under 30% extraction scenario (Smith et al. 2012, Miller et al. 2007)

Peak periods will experience most reduction in wave height (Smith et al. 2012)

- **Water user preferences and perceptions yet to be explored**
- **Unknown how likely they are to be affected by, or if they will correctly perceive any changes**



AIM: investigate wave preferences and how abundant the 'wave resource' is perceived to be.

Methods

Questionnaire (n = 403)

- Preferred wave height and period for water use
- Annual mean breaker height
- Probability of breaking heights over 6ft (1.83 m)
- Probability of 'ideal' wave conditions for water use
- **Observations of breaker height and period**

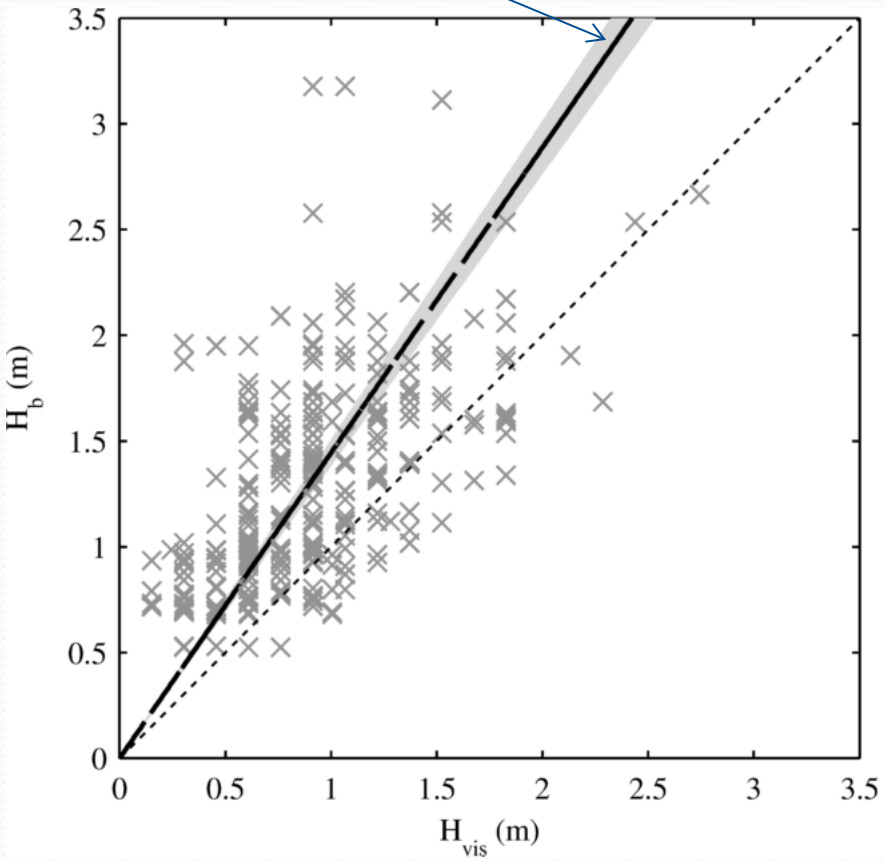
Nearshore wave measurements

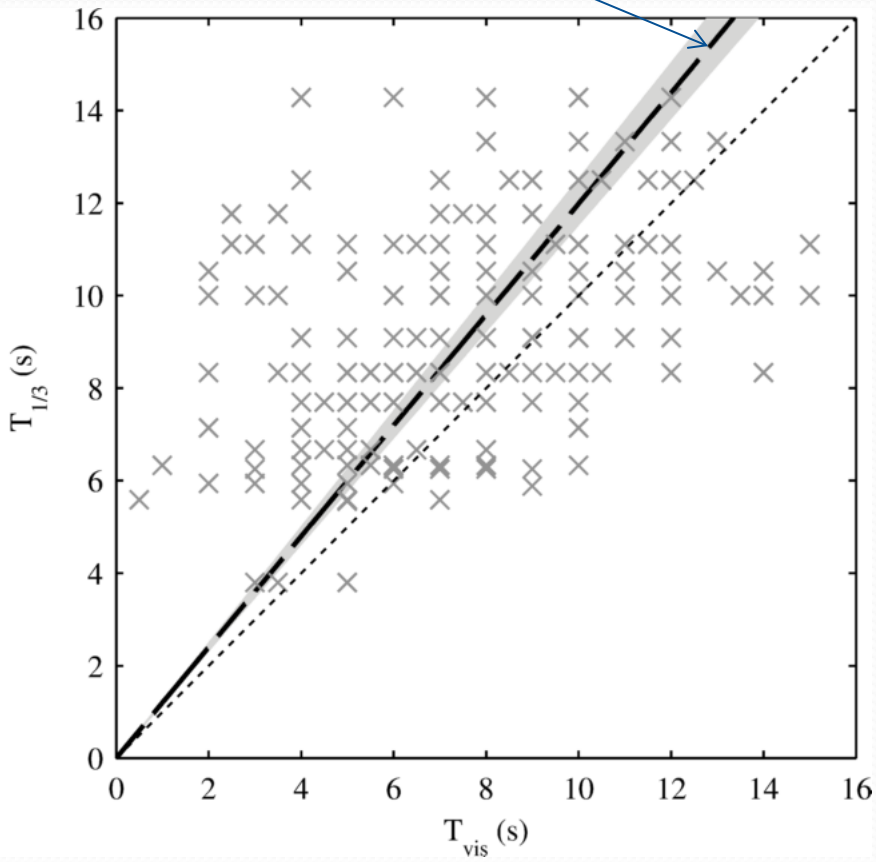
Photo and wave data courtesy of Channel Coastal Observatory.
http://www.channelcoast.org/

Wave height/period perceptions

$H_{vis} = 0.70H_b$
(RMS error 0.52 m)

$T_{vis} = 0.83T_{1/3}$
(RMS error 3.22 s)

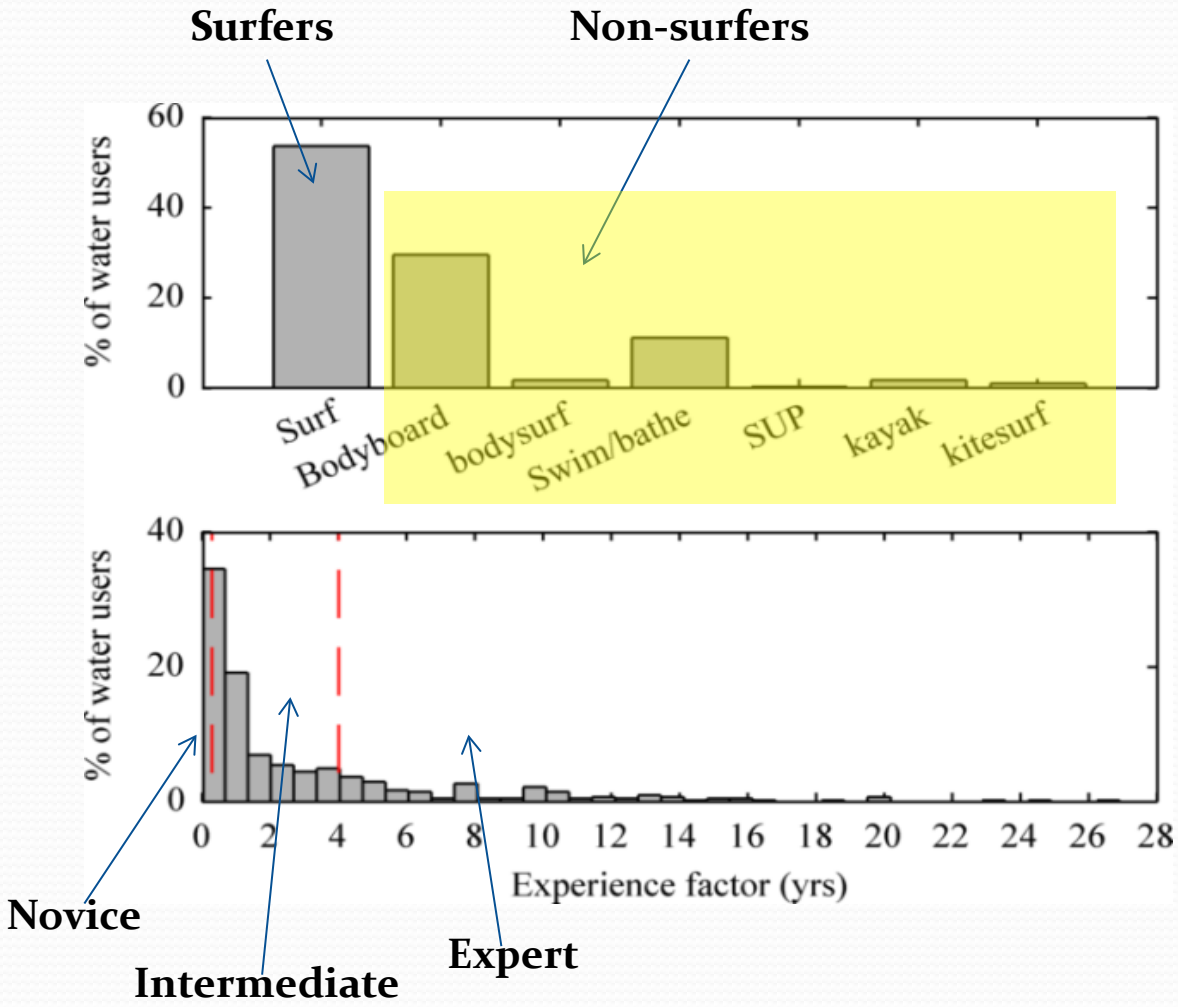




····· Line of perfect correlation for reference

— — — Mean ratio
(observation/ measurement)

Results - Water User Categories



Results - Perception ratios

Water user categories	Wave height ratios		Wave period ratios	
	Surfers	Non-surfers	Surfers	Non-surfers
Novice	0.75	0.83	0.79	0.81
Intermed.	0.63	0.70	0.87	0.81
Expert	0.59	0.62	0.81	0.81

Interpreting wave preferences

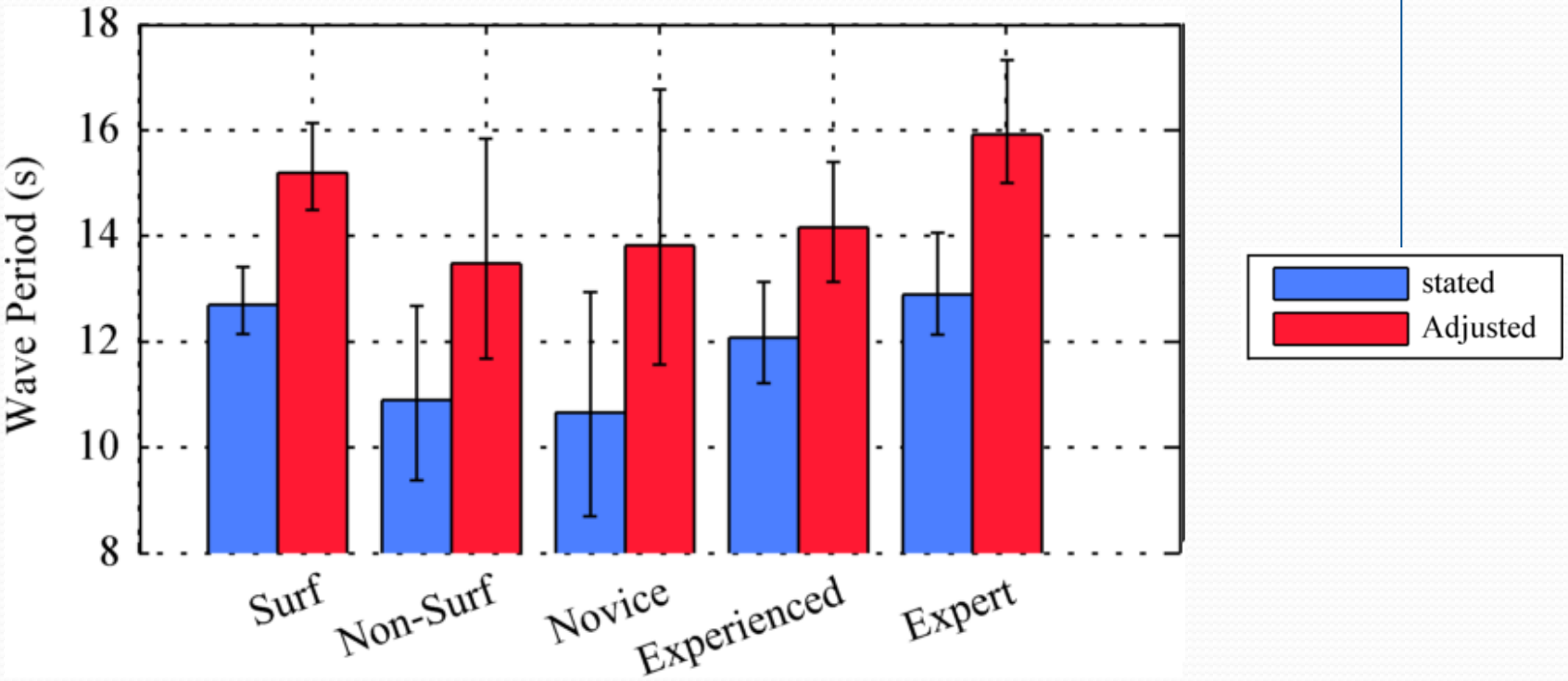
- To determine a measured trough to crest equivalent, all wave heights (and periods) were adjusted –

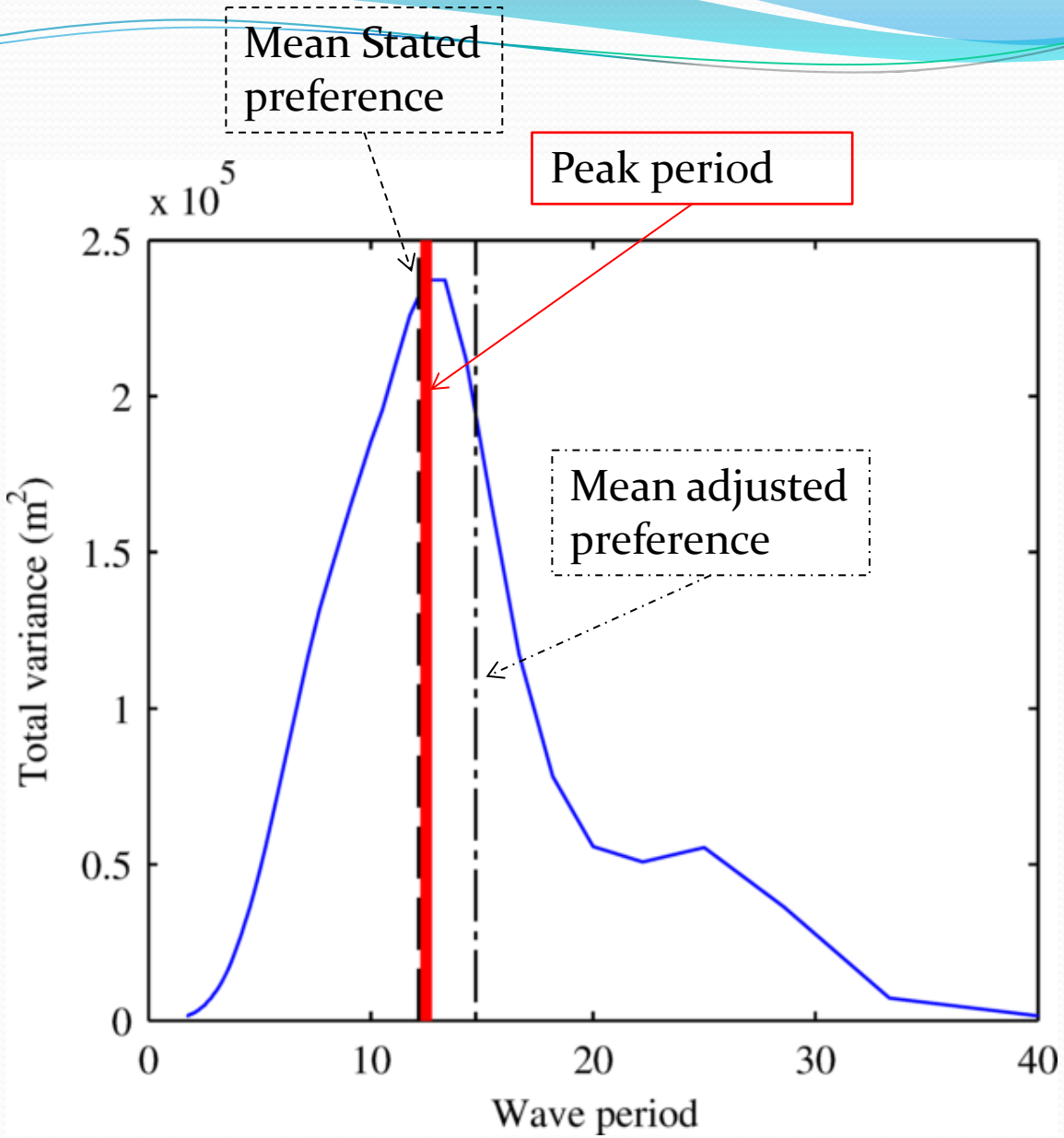
$$\text{measured conditions} = \frac{\text{stated conditions}}{\text{perception ratio}}$$

Results - Wave Preferences

$$\text{adjusted} = \frac{\text{stated conditions}}{\text{perception ratio}}$$

Preferred wave height





Summed wave spectrum from 7 years of half hourly spectra

Perception of the wave resource

Perceived abundance of 'ideal' wave conditions
(% of days in a typical year)–

Large wave conditions (H_b >1.8 m) –

novices	**48%**
intermediate	**37%**
expert	**27%**
non-surfers	**43%**
surfers	**32%**

Mean breaking wave height -

- Perceived mean H_b = 3.8 m
- Measured mean H_b = 1.75 m

- Perceived to occur on 34% of days in a typical year
- On average participants overestimated the occurrence of large waves by 19%

- novice non-surfers (17% of the sample) 50% of days
- expert surfers (18% of the sample) 25% of days

Conclusions

- Preferred wave heights 1.5 – 2.5 m
- Preferred wave period ~14 s

- Water-users generally overestimated the abundance of wave energy

- Preferred wave period of all water-users is ~ equal to the peak period, associated with the bulk of available wave energy -

Potential clash of interest between device developers and water-users?

Predicted wave impacts needs to be clearly conveyed to water-users to avoid opposition.

Thanks for listening

A full reference list can be found in the conference proceedings.

Current/further research –

- Changes in the occurrence of preferred waves under extraction scenarios
- Beach morphodynamics of relevance to water users

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